RFID to Track Hazardous Waste Shipments Across Domestic and International Borders

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There are thousands of shipments of chemicals and hazardous waste that enter the United States each year. Hundreds of thousands of tons of chemicals and hazardous wastes are shipped across our borders that are vulnerable to loss and theft. These shipments contain materials that are hazardous to human health and the environment and must be properly handled and disposed of to prevent unwanted exposure. The Resource Conservation and Recovery Act (RCRA) requires cradle-to-grave tracking of hazardous materials. Currently, commercial trucking and rail shipments provide limited safety. There are no systems in place across North America that allow for these shipments to be tracked and monitored or to be linked to existing data systems so as to enable detection of unlawful or diverted shipments. Additionally, there is no automated method to track these shipments from the generator facility to the disposal facility. Our environment, our health, and our economic security are at risk when these shipments cross our borders unchecked, untracked, and virtually unheeded.

A networked radio frequency identification (RFID) system provides the solution to track and monitor the movement of chemical and hazardous waste shipments. RFID is an emerging commodity-tracking technology that is being tested and implemented in a large number of applications worldwide. RFID is a method of transmitting data using radio waves, usually through communication with a tag. Both active and passive RFID tags may be tested to track hazardous waste shipments originating in the Mexican and Canadian border zones. The RFID tags will be tested under a variety of conditions to mimic truck transportation scenarios and warehouse storage conditions. There are physical characteristics of chemical wastes and waste containers that may interfere with the radio frequency signal. These tests will determine whether the RFID reader can gather, process, and transmit information about the location of the tagged hazardous waste as it moves from one site to another. The viability, effectiveness, cost, and scalability will be evaluated. Interferences, such as from the physical characteristics of the waste or waste containers, and signal degradation affecting the use of the technology will be identified and possible solutions will be investigated.

This poster highlights an Environmental and Sustainable Technology Evaluation (ESTE)/ Environmental Technology Verification (ETV) project that offers opportunities to achieve results consistent with EPA's environmental sustainability goals and objectives. From an environmental approach, many of the wastes that are currently managed for disposal by one facility offer

recycling potential as feedstock for another manufacturing process. This project allows EPA to identify those wastes and generators so that the dialog can occur. From an economic perspective, moving goods and materials across our borders in a streamlined, safe, and efficient mode is critical to the flow of commerce. Conversely, an incident that may require shipments to be held at the border or an incident resulting from an illegal diversion of a highly toxic waste could have severe economic public health and environmental consequences.

Notice: *Although this work was reviewed by EPA and approved for publication, it may not necessarily reflect official Agency policy.*

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